INTRODUCING THE COMPACTRON

multi-section tube gives FM TUNER/RECEIVER three-tube performance

By PHILIP E. HATFIELD, W9GFS*

BY NOW, just about everyone has heard of the "Compactron." And you'll be seeing more and more of the Compactron, too, for this new multi-function tube in its many forms will soon appear in TV sets, FM multiplex adapters, and dozens of other products. Actually, the Compactron is just what its name (a General Electric trademark) implies: an extremely compact grouping of a number of different "tubes" in a single envelope. There is almost no end to its applications, but the little FM tuner/receiver pictured here represents an ideal introduction to the device.

Since this one-tube unit can be used with earphones, it is just the thing for listening to FM programs late at night when full-scale operation of your hi-fi rig might cause domestic discord. If you want to boost FM programing to full-room volume, simply feed the output from the combination tuner/receiver into your hi-fi set. Reverting to earphone operation again will entail nothing more than changing plugs.

Although it incorporates its own power supply, this compact tuner/receiver can be built for far less than most FM tuners. And it offers the distinct advantage of enabling you to become acquainted with one of the latest developments in the tube field—the Compactron—at the same time.

About the Circuit. You can see from the schematic diagram that the 6D10

Receiving Tube Dept., General Electric Co.

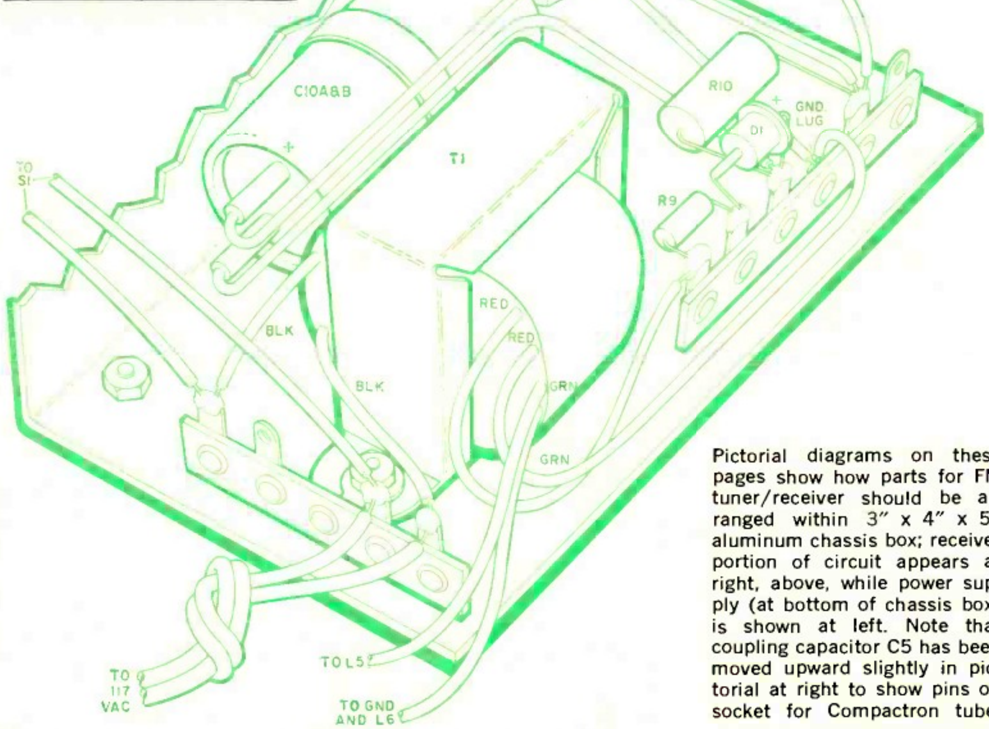
Compactron is a triple triode (see page 48). It combines the functions of an r.f. amplifier, superregenerative detector, and audio amplifier—all in one envelope.

The first section serves as an r.f. amplifier, connected in a grounded-grid circuit. For simplicity, this stage is untuned, since its principal function is to isolate the antenna from the detector.

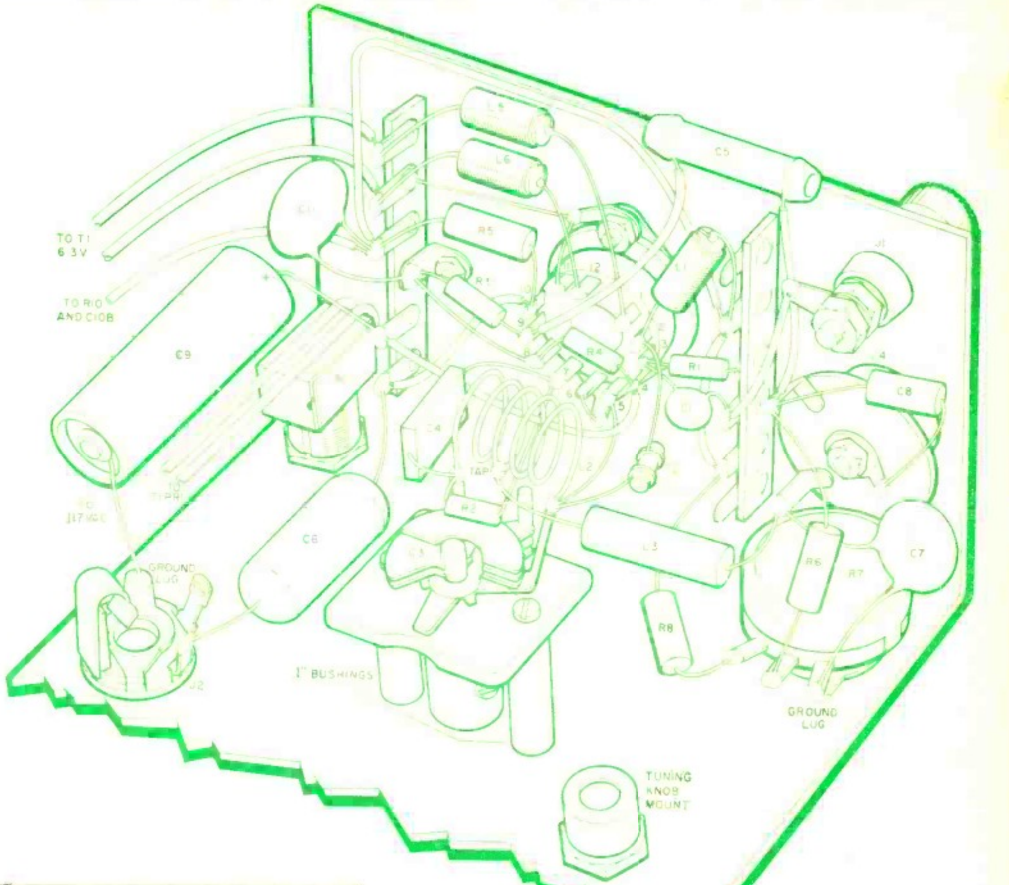
The second stage, a superregenerative detector, oscillates simultaneously at the frequency of the incoming signal and at a frequency slightly above the audible range—the so-called "quench" frequency. If you've ever done much experimenting with ordinary regenerative detectors, it shouldn't take you long to figure out how a superregenerative detector works.

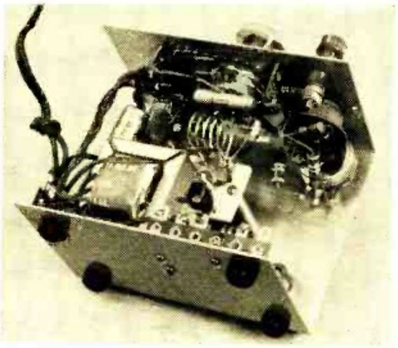
As you no doubt know, an ordinary regenerative detector is most sensitive when it's just on the verge of oscillation. But in the superregenerative circuit, the detector is pulled "in" and "out" of oscillation thousands of times each second at a rate determined by the quench frequency. The result is a circuit so sensitive that you can actually hear the thermal noise of the tube, although this noise disappears when a strong signal is received.

The detector's very high frequency (v.h.f.) oscillation takes place at the same rate as the frequency of the incoming signal; the frequency of this oscillation is determined principally by the values of coil *L2* and variable capacitor *C3*. The lower-frequency oscillation



Pictorial diagrams on these pages show how parts for FM tuner/receiver should be arranged within 3" x 4" x 5" aluminum chassis box; receiver portion of circuit appears at right, above, while power supply (at bottom of chassis box) is shown at left. Note that coupling capacitor C5 has been moved upward slightly in pictorial at right to show pins on socket for Compactron tube.



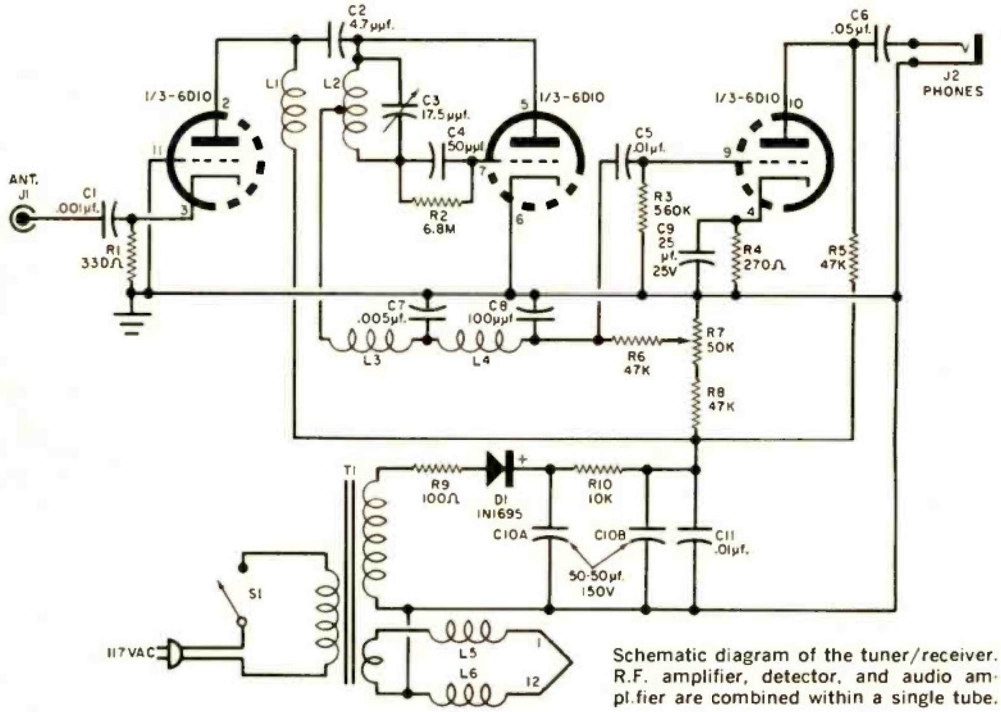


or "quench" frequency is determined chiefly by the values of capacitor *C4* and resistor *R2*, as well as the position of the tap on *L2*. Amplitude of the quench oscillation, in turn, depends on the plate voltage and can be controlled by the setting of potentiometer *R7*.

The output from the detector is fed to a filter consisting of *L3*, *C7*, *L4*, and *C8*, in order to strip the signal of v.h.f. and quench-frequency components. From the filter, it goes to the grid of the Compactron's third triode section, an ordinary resistance-coupled audio amplifier which amplifies the signal to a suitable level for headphone operation. Alternatively, the output from this stage can be fed into an auxiliary audio amplifier.

Putting It Together. The box chosen for the cabinet provides plenty of room for all components, but you'll find that assembly is easier if you follow the sequence outlined here.

Begin by punching and drilling all holes, then mount the Compactron socket, the two adjacent terminal strips, potentiometer *R7*, antenna jack *J1*, and phone jack *J2*. As much wiring as possible should be completed before you mount any additional parts. Variable capacitor *C3* should then be mounted and all wiring completed, with the ex-



Schematic diagram of the tuner/receiver. R.F. amplifier, detector, and audio amplifier are combined within a single tube.

PARTS LIST

C1—0.001-μf. ceramic capacitor
C2—4.7-μμf. ceramic or mica capacitor
C3—17.5-μμf. variable capacitor (Hammarlund HF-15 or equivalent)
C4—50-μμf. mica capacitor
C5, C11—0.01-μf. ceramic capacitor
C6—0.05-μf., 200-volt Mylar or paper capacitor
C7—0.005-μf. ceramic capacitor
C8—100-μμf. ceramic capacitor
C9—25-μf., 25-volt electrolytic capacitor
C10a/C10b—50/50 μf., 150-volt dual electrolytic capacitor
D1—1N1695 diode
J1—Screw-type banana jack
J2—Open-circuit phone jack
L1—Single layer of #30 enameled copper wire close-wound on and wired in parallel with 470,000-ohm, 1-watt resistor, 7/32" diameter and 9/16" long
L2—5 turns of #18 tinned copper wire, ½" in diameter, spaced to a length of approximately ⅝", tapped at center turn
L3—7-μh. r.f. choke (Ohmite Z-50 or equivalent)
L4—10-mh. r.f. choke (National R-100 or equivalent)
L5, L6—Single layer of #22 enameled copper wire, close-wound on and wired in parallel with 470,000-ohm, 1-watt resistor, 7/32" in diameter, 9/16" long
R1—330-ohm, ½-watt resistor
R2—6.8-megohm, ½-watt resistor
R3—560,000-ohm, ½-watt resistor
R4—270-ohm, ½-watt resistor
R5, R6, R8—47,000-ohm, 1-watt resistor
R7—50,000-ohm potentiometer, linear taper
R9—100-ohm, ½-watt resistor
R10—10,000-ohm, 2-watt resistor
S1—S.p.s.t. toggle switch
T1—Power transformer; primary, 117 volts a.c.; secondaries, 125 volts @ 15 ma. and 6.3 volts @ 0.6 amp. (Stancor PS-8415 or equivalent)
V1—6D10 tube
1—12-pin socket for above (produced by I. H. Mfg. Co., Cinch Mfg. Co., etc.)
1—3" x 4" x 5" utility box (LMB T-F779 or equivalent)
1—Miniature telescoping antenna (Lafayette F-343 or equivalent)
Misc.—Line cord and plug, wire, solder, dial, dial plate, terminal strips, hardware, etc.

ception of that for the power supply.

Note that both the rotor and stator of the variable capacitor must be insulated from the box, and that an insulated shaft extension must be used with a metal dial. The capacitor specified in the Parts List has two holes in the ceramic end-plate that allow the use of "pillars" for mounting. Other capacitors may require a small plastic plate for mounting, with mounting pillars attached to the plate.

Transformer *T1*, switch *S1*, filter capacitor *C10a/C10b*, and the other two terminal strips should now be mounted on the box and the power supply wiring completed. In order for the whip anten-

(*Continued on page* 114)

Compactron FM Tuner/Receiver

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na specified in the Parts List to be used with a jack-top binding post, you'll have to attach a standard banana plug to the whip. In the author's case, a force fit was made between the whip and the plug, although the two could be soldered together.

Hooking It Up. With a pair of headphones plugged in and the whip antenna extended, throw switch *S1* to "on" and allow a few minutes for the tuner/receiver to warm up. Next, turn potentiometer *R7* clockwise until a hissing sound is heard, and then turn the dial over its range. When a station is located, adjust both the dial and the potentiometer until you reach settings which deliver maximum volume with minimum distortion.

If you have trouble obtaining good coverage of the FM band, adjust the inductance of *L2* by stretching the coil or squeezing the turns together, depending on whether you want to decrease or increase the inductance of the coil.

With the whip antenna shown, good signals should be received from all local FM stations. It is possible to use an outside antenna with the tuner/receiver, of course, but this is not recommended. Even though there is an isolating stage between the antenna terminal and the detector, radiation is still possible, and the use of an outside antenna might prove a nuisance to other FM receiver owners.

Almost any dial can be used on the receiver. The one on the model is a National Type K with a scale carrying a rough calibration glued on the front. In the author's case, after the frequency range was determined, the scale was made by preparing a drawing on tracing paper and using this drawing to make a contact print on single-weight photographic paper. The completed scale was cemented to the dial plate and then sprayed with Krylon.

Be sure to make your scale slightly smaller in diameter than the dial plate so that the rim-drive mechanism can work properly. –30–